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54 A method of depositing a copper pattern on a substrate.

57 In a method of electrolessly depositing copper on a sub-
strate, a palladium seed pattern is formed by directing light (eg
from a laser) at the substrate in the presence of the vapour of a
palladium compound, such as palladium (II) bis-(hexafluoro-
acetylacetonate). The substrate may be first coated with a poly-
mer which is removed by excimer laser irradiation.

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In an alternative process, the substrate is first covered with photoresist or polymer. When the substrate which has been coated with the polymer is selectively irradiated, for example, through a mask, with a pulsed excimer laser, removal of the polymer occurs in the irradiated area. By exposing the substrate to the vapours of the palladium-containing complex, deposition of a palladium film occurs at the same place. The film then acts as a seed for plating of copper. In this way, the circuitry is embedded in a polymeric film, the surfaces of which are level. The circuitry is thus protected from mechanical damage. The ablative etching and the deposition of the metal seed can take place either simultaneously or as separate steps in the same apparatus.

The preferred palladium compound is palladium (II) bis-(hexafluoroacetylacetonate) which is usually written as $\text{Pd}(\text{hfac})_2$. Other derivatives of this compound may also be used. In general, the preferred palladium compounds are those in which the palladium is bonded to oxygen.

EXAMPLE

A silicon wafer coated with a 2.4 micron thick layer of cured polyimide was placed in a vacuum chamber equipped with a quartz window and a well to hold the metal complex out of the path of the light. The coated wafer was irradiated in the presence of vapour of palladium(II) bis-(hexafluoroacetylacetonate) in a patterned fashion with light from a pulsed excimer laser operating at 249 nm. After a thirty-second exposure at a power density of about 5 Mwatt/cm² and a repetition rate of 100 Hz, the polymer was completely removed from the silicon substrate in the areas of irradiation and a thin layer of grey palladium metal was visible on the surface. Subsequent plating in an electroless copper bath gave copper features which had a thickness almost that of the remaining polymer layer. Adhesion of the copper to the silicon (by adhesive tape test) was better than that of the polyimide.

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9. A method as claimed in any of claims 1 to 5, in which the substrate is a polymer substrate.

10. A method as claimed in any of claims 1 to 5, in which the substrate is an aluminium substrate.